# UFM Software Architecture

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The following figure shows the UFM high-level software architecture with the main software components and protocols. Only the main logical functional blocks are displayed and do not necessarily correspond to system processes and threads.

*UFM High-Level Software Architecture*
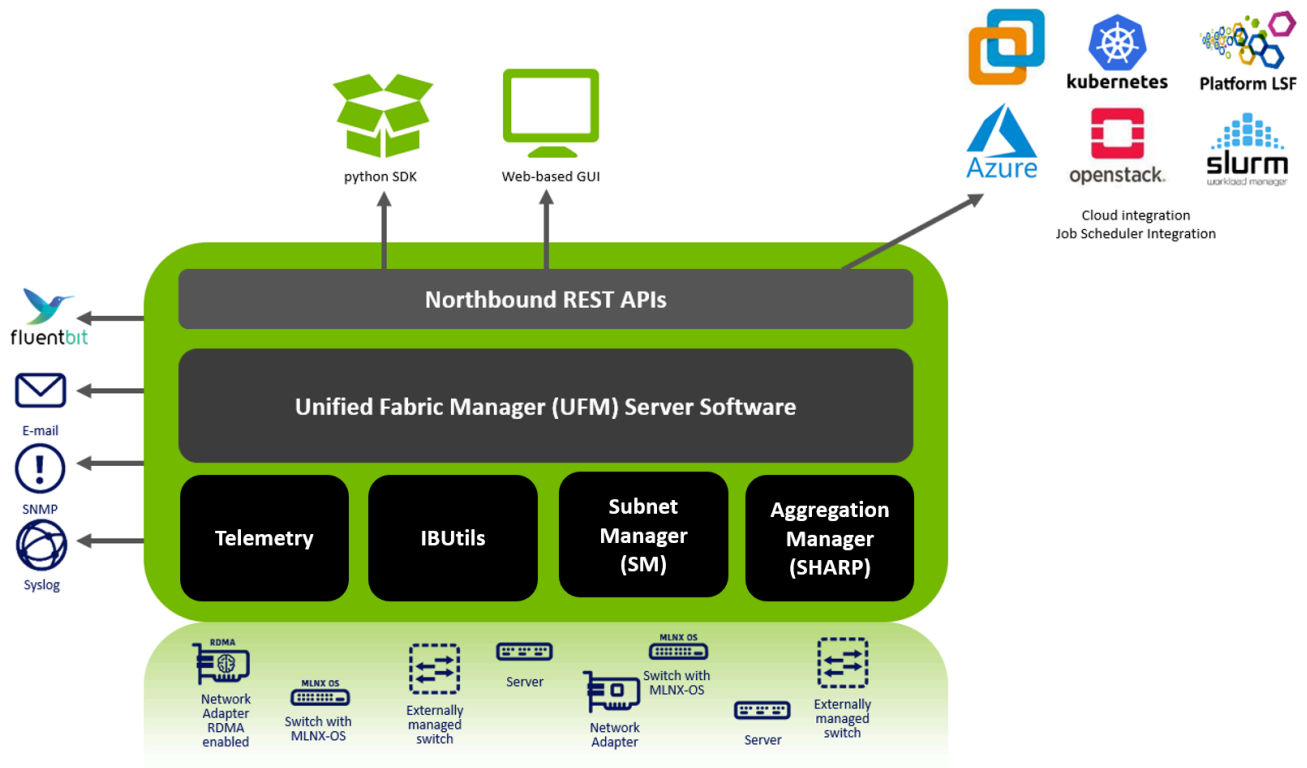


# Graphical User Interface

UFM User Interface is a web application based on JavaScript and Angular JS, which is supported by any Web Browser. The Web application uses a standard REST API provided by the UFM server.

# Client Tier API

Third-party clients are managed by the REST API.

# Client Tier SDK Tools

Support for UFM's API and a set of tools that enhance UFM functionality and interoperability with third-party applications are provided as part of UFM.

## UFM Server

UFM server is a central data repository and management server that manages all physical and logical data. UFM-SDN Appliance receives all data from the Device and Network tiers and invokes Device and Network tier components for management and configuration tasks. UFM-SDN Appliance uses a database for data persistency. The UFM-SDN Appliance is built on the Python twisted framework.

## Subnet Manager

Subnet Manager (SM) is the InfiniBand "Routing Engine", a key component used for fabric bring-up and routing management. UFM uses the Open Fabric community OpenSM Subnet Manager. UFM uses a plug-in API for runtime management and fabric data export.

## NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP)™ Aggregation Manager

NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP) is a technology that improves the performance of mathematical and machine learning applications by offloading collective operations from the CPU to the switch network.

Aggregation Manager (AM) is a key component of NVIDIA SHARP software, used for NVIDIA SHARP resources management.

For further information about NVIDIA SHARP AM, refer to Appendix - NVIDIA SHARP Integration .

## Performance Manager

The UFM Performance Manager component collects performance data from the managed fabric devices and sends the data to the UFM-SDN Appliance for fabric-wide analysis and display of the data.

## Device Manager

The Device Manager implements the set of common device management tasks on various devices with varying management interfaces. The Device Manager uses SSH protocol and operates native device CLI (command-line interface) commands.

## UFM Switch Agent

UFM Switch Agent is an integrated part of NVIDIA switch software. The agent supports system parameter discovery and device management functionality on switches.

## Communication Protocols

UFM uses the following communication protocols:

- Web UI communicates with the UFM server utilizing **Web Services** carried on **REST API**.

- The UFM server communicates with the switch Agent located on managed switches by proprietary **TCP/UDP**-based discovery and monitoring protocol and **SSH**.

- Monitoring data is sent by the switch Agent to UFM server Listener by a proprietary **TCP**-based protocol.